REMARKS

As a preliminary matter, Applicants appreciate the time and courtesy extended by the Examiner during the telephone interview of April 21, 2004. During the interview, the allowance of Claims 18-24 was withdrawn, and Claims 18-24 were rejected under 35 U.S.C. §102(b) as being anticipated by United States Patent No. 5,790,334 to Cunningham.

As an additional preliminary matter, Applicants appreciate the Examiner's indication that Claims 4-6, 9-11, 16 and 17 have been allowed.

Claims 18-28 stand rejected under 35 U.S.C. §102(b) as being anticipated by United States Patent No. 5,790,334 to Cunningham. Applicants respectfully traverse this rejection.

Applicants respectfully submit that the Cunningham reference fails to disclose all of the features of the present invention as defined in independent Claims 18, 21, 25 and 27. More specifically, the Cunningham reference fails to disclose a method or a medium including code that, *inter alia*, determines a numerical value of a variation in the temperature of the electromagnetic transducer based on a certain parameter. In this amendment, Claims 18, 21, 25 and 27 have been amended to clarify that an actual determination of the variation in temperature is made by now stating that the "numerical value" of the variation in temperature is determined.

The Examiner states that the Cunningham reference discloses deriving a variation in temperature of the electromagnetic transducer. *See* page 3, lines 10-12 of the March 3, 2004 Office Action. In column 3, lines 19-38, the Cunningham reference mentions

that the actual bias supplied to the MR read head is adjusted to an optimum level as determined by the ratio of two resistances. The Cunningham reference also mentions that the ideal resistance ratio may be calculated based on the relative heating that occurs at each bias level. In column 6, line 43 to column 7, line 3, the Cunningham reference mentions the availability of the optimal MR read head bias. The Cunningham reference also mentions that the temperature of the MR read head can be estimated by utilizing the resistance ratio so that the resistance ratio can be used to approximate the temperature rise of the MR element and the actual temperature of the MR read head. The functions of the elements shown in Fig. 2 are described in column 8, line 21 to column 9, line 32. The Cunningham reference discloses controlling the actual resistance ratio in order to set the MR head bias supply level in Fig. 4; and column 9, line 58 to column 10, line 38. During this processing, the actual resistance ratio is approximated by the ideal resistance ratio.

On the other hand, the present invention of the independent Claim 18, 21, 25 and 27 actually determines a numerical value of a variation in temperature of the electromagnetic transducer based on a certain parameter. In the embodiment defined in dependent Claim 23, the present invention actually calculates the variation or rise ΔT in temperature by utilizing the following equation:

$$\Delta T = \frac{\Delta R}{R_{ini}}\gamma = \frac{R - R_{ini}}{R_{ini}}\gamma$$

See, e.g., page 15 of the present specification. The Cunningham reference fails to disclose making an actual determination of the numerical value of the variation in temperature of the electromagnetic transducer.

Certainly, the Cunningham reference mentions that the resistance ratio serves as an approximation of the temperature rise of the MR read heads 108 in column 8, lines 52 to 54. The Cunningham reference also mentions that the temperature of the MR read head can be estimated by utilizing the resistance ratio in column 6, lines 61-66. However, Applicants believe that this mention would not lead one of ordinary skill in the art to an actual calculation of the numerical value of the variation in temperature of the electromagnetic transducer. The resistance ratio may indicate an approximated value of the variation in temperature, however, the resistance ratio does not indicate its numerical value, i.e., its actual value. It is evident that the magnitude control of the sensing current can be achieved with high accuracy by utilizing the actual numerical value of the variation in temperature rather than utilizing the approximated value of that. Accordingly, Applicants submit that independent Claims 18, 21, 25 and 27, and associated dependent Claim 19, 20, 22-24, 26 and 28 should be allowed.

Additionally, Applicants also assert that the Cunningham reference fails to disclose the determination of a numerical value of an expected lifetime of the electromagnetic transducer, as defined in dependent Claims 19 and 22. Claims 19 and 22 have been amended to clarify that the numerical value of an expected lifetime of the electromagnetic transducer is determined based on the numerical value of the variation in

temperature. The Abstract of the Cunningham reference (lines 14-16) mention that the maximum allowable bias current level is controlled so as to preserve the overall life expectancy of the MR heads. The Cunningham reference also mentions that the maximum allowable bias current level is not exceeded in order to preserve the overall life expectancy of each MR head (column 3, lines 59-61). Column 6, lines 43-54, mentions that the maximum allowable bias current level is determined so as to preserve the overall life of each individual MR head. In order to determine the desired current levels, the Cunningham reference derives a plot of head lifetime vs. temperature for the MR stripe. *See* column 9, lines 46-57.

On the other hand, the present invention of Claims 19 and 22 determines a numerical value for the expected lifetime [hour] of the electromagnetic transducer. In one embodiment, this numerical value is determined by utilizing the following equation:

$$\tau = \frac{1}{J^2}\alpha \cdot \exp\left(\frac{1}{T}\beta\right)$$

See page 15 of the present specification. The representation J specifies the current density (quantity of the current per unit cross-sectional area) of the MR element 45. The representation T specifies the temperature [K] of the MR element 45. From the foregoing, Applicants submit that the Cunningham reference fails to concretely disclose the actual determination of a numerical value of an expected lifetime of the electromagnetic transducer. Thus, for these additional reasons, Applicants respectfully submit that dependent Claims 19 and 22 should be allowed.

Applicants respectfully request clarification in a contradiction in the Examiner's statements. The Examiner states that "[h]owever, Cunningham do not teach deriving an expected lifetime of the electromagnetic transducer based on the variation in temperature when determining the magnitude of the sensing current..." in the March 3, 2004 Office Action, on page 5, lines 11-17. Please clarify why dependent Claims 19 and 22 were rejected in the March 3, 2004 Office Action when the Examiner seems to accept the patentability of the subject matter of Claims 19 and 22 in the statements made on page 5 of the March 3, 2004 Office Action.

For all of the above reasons, Applicants request reconsideration and allowance of the claimed invention. Should the Examiner be of the opinion that a telephone conference would aid in the prosecution of the application, or that outstanding issues exist, the Examiner is invited to contact the undersigned.

Respectfully submitted,

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